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ABSTRACT

A study was conducted to (1) examine children's visual and auditory attention to, and comprehension of, narrated and nonnarrated versions of two television programs, and (2) test a measure of auditory attention in relation to visual attention and to comprehension of information presented with or without narration. Subjects, 117 five- and seven-year old boys and girls, were presented with a narrated and nonnarrated version of animated stories during which they could push a lever to restore auditory clarity when the soundtrack was periodically degraded. Children's restore responses and visual fixations were recorded. After viewing, the subjects completed a comprehension test to assess auditory and visual comprehension. The results indicated that narration significantly enhanced visual attention and comprehension of visual, auditory, and inferential information. No effect of narration was found for auditory attention. Older children had significantly higher scores than younger children on auditory attention and on visual, auditory, and inferential comprehension. No age effect was found for visual attention. Partial validation of the auditory attention measure was found with the correlational analyses. Auditory attention predicted recall of auditory information better than visual information, while visual attention predicted the reverse pattern when the program was narrated. The study concluded that children monitored the auditory component of television to direct visual attention to central information, as well as to process auditory, especially verbal, content. (Tables of data are included.) (Author/HTH)

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Children's Auditory and Visual Processing of Narrated and Nonnarrated Television Programming

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Abstract

A study was conducted with five- and seven-year-old boys and girls, (a) to examine children's visual and auditory attention to, and comprehension of, narrated and nonnarrated versions of two television programs, and (b) to test a measure of auditory attention in relation to visual attention and to comprehension of information presented with or without narration. The auditory attention measure consisted of degradation of audio clarity at plot-critical moments in the program. Children could restore clarity by pressing a lever. Latency of lever presses indexed children's moment-to-moment auditory attention. Results indicated that narration significantly enhanced visual attention and comprehension of visual, auditory, and inferential information. No effect of narration was found for auditory attention. Older children had significantly higher scores than younger children on auditory attention and on visual, auditory, and inferential comprehension. No age effect was found for visual attention. Partial validation of the auditory attention measure was found with the correlational analyses. Auditory attention predicted recall of auditory information, better than visual information, while visual attention predicted the reverse pattern when the program was narrated. It was concluded that children monitor the auditory component of television to direct visual attention to central information, as well as to process auditory, especially verbal, content.

Children's Auditory and Visual Processing of Narrated and Nonnarrated Television Programming

Introduction

The conventional wisdom in the literature is that when children process televised information, they rely more heavily on the visual component of the medium while the auditory component is treated as if it were of secondary importance. It has been hypothesized that the auditory component of television is used primarily to monitor a program while one is not looking in order to know when it is important to visually attend to the screen, that is, when something interesting or critical for comprehension is occurring. It has also been suggested that auditory attention is used to process the language of television (Rice, in press) and thereby to access central information presented in the auditory modality. Thus, looking at the screen serves as a measure of fluctuations in general attentiveness to the program while auditory attentiveness indexes the background level of monitoring as well as attention to uniquely auditory events, principally language, and the semantic processing thereof.

The present paper examines this hypothesis and reports a study of visual and auditory attention to, and comprehension of, narrated and nonnarrated versions of two television programs by young children.

In a series of experiments, Hayes and Birnbaum (1980) found that after viewing either a mismatched audio-video television presentation or separate audio and video presentations, preschool-age children demonstrated a visual-superiority effect in that they displayed a greater recognition of the visual information than the auditory information (c.f. Colavita, 1974; Posner, Nissen, & Klein, 1976). In a subsequent study, Hayes, Chemelski, and Birnbaum (1981) found that when instructed to remember the content of a television program, preschoolers demonstrated an increased visual-superiority effect on recognition of auditory and visual information as compared to children not given those instructions. And Meringoff (1980) found that when six- to ten-year-old children had to recall story events presented in either a televised or picture-book format, children in the television condition relied more on the visual aspects of the story, while those in the picture-book format condition relied more on the verbal text. It was as if pictures predominate over words when they are moving and changing, but not when they are static illustrations (c.f. Reeves, Thorson, Rothschild, McDonald, Hirsch, & Goldstein, 1984).

Pezdek and Stevens (1984) found, however, that in normal viewing situations, in which the auditory and visual components of television are matched, the visual-superiority effect disappeared. Further, Anderson, Lorch, Field, and Sanders (1981) found that preschool-age children's visual attention was reduced

when the auditory attribute of narration was not comprehensible relative to when narration was understandable.

Lorch, Anderson, and Levin (1979) argue that the cues for comprehensibility for children are the non-content auditory attributes or formal features. Formal features are the auditory and visual codes--the production techniques--of the medium. (See Anderson, Alwitt, Lorch, & Levin, 1979; Anderson & Levin, 1976; Huston & Wright, 1983; Huston, Wright, Wartella, Rice, Watkins, Campbell, & Potts, 1981; Huston-Stein & Wright, 1979; Levin & Anderson, 1976; Rice, Huston, & Wright, 1982, 1983). As children become experienced with these features, they become familiar with how they are used and the content with which they are associated. Lorch et al. (1979) proposed that these features signal interesting or uninteresting content for children. An adult male voice on television, for example, generally connotes adult-level content which the young child may find uninteresting or incomprehensible. Accordingly, children are less attentive to adult male voices than to female or children's voices, or the peculiar voices of animated characters. The auditory codes of television, then, can signal whether or not information is attention-worthy.

Lorch et al. (1979) further proposed that children develop a sophisticated strategy of television viewing, one which allows them to divide their visual attention effectively between television and other activities, such as playing with toys,

without reducing comprehension. Children monitor the soundtrack at a nonsemantic level and listen for particular auditory features which signal informative or comprehensible content. When interest is thus triggered by auditory cues, children visually attend to the screen and semantically process the auditory information. When the content is no longer comprehensible or interesting, the children will resume the other activity and return to peripheral auditory monitoring. Consistent with this proposition, Pezdek and Hartman (1983) found that in a video-only viewing condition with toys present, comprehension and visual attention were significantly reduced, presumably because there were no auditory cues to redirect visual attention when the child was not viewing the screen. It appears, then, that the auditory component directs children's visual attention in television presentations.

While Lorch et al. (1979) claimed that children processed auditory information at a nonsemantic level during periods of low visual attention, Pezdek and Hartman (1983) found that in some instances young children semantically processed the verbal content, even when they were not visually attending to the screen. The presence of toys effectively reduced visual attention, but not comprehension, during mixed-modality segments of a television program where central information was presented only through narration. Pezdek and Hartman noted that while auditory cues accompanied important visual content in the Lorch et al. (1979) study, there was no plot-relevant visual content in this condition

of their own study and therefore no visual competition for semantic processing of the soundtrack. Further, Beagles-Roos and Gat (1983) found that six- to ten-year-old children's recall of central content was equivalent for radio and television presentations of a story. These findings suggest that not only does the auditory component of television direct children's visual attention to informative content, but that children process centrally relevant information through narration even during periods when little or no visual information is being presented.

While narration is effective in communicating with young viewers in the absence of competing visual information, it can also signal the child when to look. Thus in a program designed to tell a story without narration, the addition of narration could serve to enhance visual attention and comprehension, as well as provide additional verbal elaboration for semantic processing by the child. The evidence, then, would favor the dual role of verbal content in children's processing of television.

Despite evidence for the importance of the auditory modality as a mediator of children's comprehension of television, measurement has been a serious problem because listening has no easily observable indicators that are analogous to visual orientation. In order to separate the auditory and visual aspects of attention, it would be desireable to develop a running or periodic measure of listening that would complement visual fixation as a running assessment of looking. In the past, visual

attention was used as an index of both visual and auditory attention. Recall of material presented auditorily, a delayed and indirect measure, was the only index of listening that was independent of looking.

The present study was designed to test a measure of auditory attention in relation to visual attention and to recall of information presented in one or both modalities of television as a function of the presence of narration.

The programs selected as stimuli consisted of two animated stories originally produced without narration or dialogue, accompanied by music and other nonsemantic auditory features. Centrally relevant information was presented in the visual modality, so that the story was fully comprehensible without narration. An alternate narrated version of each program was made. In these narrated versions, an adult female voice conveyed the central elements of the visual plot, adding some new information that was not obvious in the original version so that recall of semantic content could be tested separately.

In an earlier study, (Rolandelli, Wright, & Huston, 1982) we developed a periodic measure of auditory attention based on a technique developed by Lindsley (1962) and similar to one used by Friedlander and de lara (1973). Children were pretrained to press a lever to restore audio clarity of the soundtrack which was gradually degraded at plot-critical intervals throughout the program. Rolandelli et al. (1982) argued that the speed with

which a child responds to initial deterioration in audio quality is an index of the child's interest in what is happening at that moment in the auditory modality. In the present study, it was predicted that children's latency to restore audio clarity (also a measure of degree of degradation children found tolerable) would be shorter in the narrated condition than in the nonnarrated condition.

Because visual fixation has been shown to be an index of children's general attention to television, all looks to and away from the television were recorded. It was predicted that children's overall duration of looking would be higher in the narrated condition than in the nonnarrated condition.

A comprehension test was also employed to see if the presence or absence of narration differentially effected children's understanding of the televised information where central content was presented in both the visual and auditory modalities. Three sets of items were developed to assess children's comprehension. One set asked for recall of concrete information presented in the visual modality only. A second set covered concrete information presented in the auditory modality only. Additional items assessed children's knowledge of information which could be inferred from either modality but which were not explicitly stated or shown. The auditory-only comprehension items served to index auditory attention after the fact and provided a standard against which to validate the periodic measure of auditory attention as

an assessment of auditory processing.

To determine if children's visual comprehension would increase as a function of narration, visual-only items were also used on the comprehension test. If comprehension of these items were higher in the narrated condition than in the nonnarrated condition, as was predicted, it would suggest that the auditory attribute of narration elicited greater visual attention leading in turn to better processing of visual content.

Information which could be inferred visually or auditorily was also assessed on the comprehension test. It was predicted that inferential knowledge would be higher in the narrated condition than in the nonnarrated condition, because both auditory and visual content supported the requisite inferences, so that the enhanced processing predicted for the narrated condition should support more complete and accurate inferences about the story.

Also, a developmental difference between two age groups of children was predicted. Because younger children are more perceptually-oriented while older children tend to be more conceptually-oriented, it might be expected that older children would be more attentive to centrally relevant information than younger children. Therefore, older children should display higher levels of visual and auditory attention as well as higher comprehension scores for both narrated and nonnarrated conditions.

Finally, regardless of age, visual attention, because of its superior generality as an index of central processing level,

should predict all forms of comprehension (except for the auditory items of the nonnarrated condition which could only be correctly answered by guesses). By contrast, auditory attention, definded as mean latency of restoration of the degraded sound track, should predict auditory and inferential comprehension but not visual comprehension, in the narrated condition. In the nonnarrated condition, auditory attention to the nonsemantic auditory formal features could serve only to direct selective visual attention to important content. Thus it should only predict inferential recall of central information. The expectation that auditory attention would not predict visual concrete comprehension in either the narrated or nonnarrated version results from the following reasoning: Visual concrete recall should depend on the gross amount of visual attention, which is not affected by auditory monitoring. By contrast, inferential recall in the nonnarrated condition should best result from selective visual attention to central plot events, and that visual selectivity is precisely what auditory monitoring is hypothesized to direct.

Method

Five- and seven-year-old girls and boys were presented with a narrated and nonnarrated version of animated stories during which time they could restore auditory clarity when the soundtrack was periodically degraded. Children's restore responses and visual fixations were recorded. After viewing, the children were given a comprehension test to assess auditory and visual comprehension.

Subjects

One hundred seventeen middle-class boys and girls at two age levels (five- and seven-year-olds) in Topeka, Kansas, served as subjects. The five-year-old group consisted of 27 males and 28 females while seven-year-olds consisted of 36 males and 26 females.

Apparatus

A partition containing a one-way mirror divided the experimental room into a subject treatment area and an experimenter working area. In the treatment area, a small chair and a low table upon which were placed toys and coloring materials, used as distractors, were provided. The chair was at a right angle to a color television monitor placed approximately two meters away. Attached to the end of the table nearest the monitor was a large soft lever which when pressed would restore audio clarity.

Behind the partition were located several pieces of equipment operated by an adult male experimenter and an assistant. The subject's visual fixation to the screen, the subject's restore responses, and automatic restore responses to auditory degrades were scored on an electronic scoring device. Visual attention was scored as "on" when the child was visually fixating on the monitor and as "off" at all other times. Inter-observer reliability is 92-95% on this measure.

Auditory degrades. A specially designed noise generator was used to present auditory degradation of the soundtrack. It consisted of a small box with two slide pads. One pad controlled the volume of the stimulus-tape soundtrack while the other pad controlled the volume of white noise generated on the experimenter-side of the partition. The auditory output of mixed soundtrack and white noise could be heard from the monitor located in the subject treatment area. The slow degrade was provided by simultaneously fading the soundtrack out and the noise track in. Restores were an instantaneous reversal of these fades.

Auditory degrades were located at selected plot-critical moments in each stimulus program. The onset of a degrade was indicated to the experimenter by a tone on the stimulus tape on a channel separate from the soundtrack. Only the experimenter could hear the tone through a set of headphones. When the tone signalled a degrade, the experimenter slowly moved the slide pads on the noise generator to cross-fade the soundtrack with the white noise. The degrade was gradual so that the soundtrack was still audible near the beginning of the degrade but continually deteriorated so that the white noise which had gradually increased in volume was all that was audible at the completion of a fully extended degrade, which was 20/100's of a minute or approximately 12 seconds. The experimenter restored clarity when either the subject pressed the lever, or the timer indicated the 12-second degrade had expired, whichever came first. A child's mean total

latency score was calculated by averaging the child's latency score of his or her restore responses with the latencies of those degrades where the child did not restore.

Stimulus material. Two animated stories from the children's television show Pinwheel were selected as the stimulus programs. Two programs were used to minimize effects of a particular show. Each was approximately seven minutes in length. One featured a mole trying to return a fallen star to the sky. The other featured a bunny who helps a girl find a runaway dog she had been taking care of for a friend. These particular cartoons were chosen because they were of comparable length and were judged to contain similar formal features. While the programs contained music and sound effects, neither employed narration or dialogue. A narrated and nonnarrated version of each program was made with all other features of the original programs held constant. Narration described visually presented information and added information that could not be obtained visually. An adult female voice-over was used.

A two-minute demonstration tape consisting of a segment from a Dr. Seuss cartoon was made to pretrain children on the use of the lever to restore auditory clarity when it was degraded.

Comprehension test. Cued recall and recognition items were constructed for each program. Questions were designed to measure content that was presented in the auditory modality only (i.e., narration), the visual modality only, and for content which could

be inferred from either modality. For each show, there were four questions for each of the three content types. In the recall form, each item, worth two points, had two wrong choices, one made from another part of the story and the other a stereotypic alternative. The multiple-choice recognition items, each worth one point, were designed to be used whenever the child gave no response or a wrong response to the cued recall form of that item. A maximum score of eight points was possible for each of the three content subtests. A maximum of 24 points was possible for the total comprehension score.

Procedure

Each child was escorted to the treatment room by the experimenter and seated in the chair at a right angle to the monitor. Then, the experimenter explained to the child that she or he could play with the toys and/or drawing materials. The subject was also told that she or he could look at cartoons on the television which would commence momentarily. Behind the partition, the assistant began playing the demonstration tape. As the demonstration tape played, the experimenter told the child that sometimes, the sound on the television went bad and that by pressing the lever, the child could restore the sound. The child was also told that if he or she did not restore the sound it would eventually restore itself but that the child could restore it more quickly. Once the child mastered the task--which all children did quickly--the experimenter told the child that he was going to do

some work behind the partition while the child could play at the table and watch television. The experimenter told the child that he would return when the cartoons were over.

Each child saw one program without narration and the other show with narration. The stories shown with and without narration were counterbalanced across subjects. During treatment, the assistant coded the child's visual attention while the experimenter operated the auditory-degrade equipment.

After the child viewed the two programs, the experimenter administered the comprehension test. Comprehension of the second program seen was measured first, while comprehension of the first program viewed was measured last. In an earlier study using this counterbalancing, there was no difference on retention of information on recall items for two stories (Wright, Huston, Ross, Calvert, Rolandelli, Weeks, Raeissi, & Potts, 1984). If the child did not know the correct answer to the recall question, the recognition form of the item was presented. Presentation of the answers for each recognition item was counterbalanced across subjects. If the child did not answer the recognition item correctly, the question was scored as incorrect and the experimenter presented the next question.

Results

An age(2) X sex(2) X narration(2) repeated measures multivariate analysis of variance (MANOVA) was conducted with age (five- and seven-year-olds) and sex as between-subjects factors

and narration (narrated and nonnarrated) as the repeated within-subjects factor. Two sets of dependent measures were analyzed: (1) Auditory attention (as measured by mean total latency to restore), visual attention (as measured by average duration of looking per minute), and total comprehension (the sum of the three subtest scores); and (2) The three comprehension subtests (auditory, visual, and inferential comprehension). Univariate analyses of variance (ANOVA) were also generated for these dependent measures. Zero-order raw and partial correlation coefficients, with age partialled, were generated between the attention (auditory and visual) and the comprehension measures for narrated and nonnarrated presentations.

Age Effects

There was a main effect of age in the multivariate analysis of variance, Pillais (.42381), $F(3,98)=24.03$, $p < .001$. The means for each dependent variable appear in Table 1. The pattern of means is shown in Figure 1. Univariate F-tests yielded significant main effects of age on total comprehension and auditory attention. The seven-year-olds performed better than the five-year-olds on total comprehension and had higher levels of auditory attention. The strongest effect occurred for total comprehension, $F(1,100)=52.22$, $p < .001$, followed by Auditory Attention, $F(1,100)=24.34$, $p < .001$. No significant age effect was found for visual attention, though the direction of difference again favored the older children. MANOVA yielded no significant

interactions with age when dependent measure scores were averaged across narration.

As expected, a significant main effect of age was also found on the comprehension subtests, Pillais (.36690), $F(3,107)=20.67$, $p < .001$. Older children performed significantly better than younger children on all three subtests. The strongest effect occurred for inferential comprehension, $F(1,109)=43.17$, $p < .001$, the next strongest effect occurred for auditory attention, $F(1,109)=38.61$, $p < .001$, and the least strong effect for visual comprehension, $F(1,109)=27.27$, $p < .001$.

Narration Effects

There was a significant overall effect of narration, Pillais (.07140), $F(3,98)=28.13$, $p < .001$, whereby children in the narrated condition scored higher on attention and comprehension measures than did children in the nonnarrated condition. Univariate F-tests yielded significant narration effects for total comprehension and visual attention. The strongest effect was found for total comprehension, $F(1,100)=80.77$, $p < .001$. The next strongest effect was found for visual attention, $F(1,100)=34.76$, $p < .001$. No effect of narration was found for auditory attention. No interactions of sex, age, and narration were significant.

A significant effect of narration on the comprehension subtests was found, Pillais (.49923), $F(3,107)=35.56$, $p < .001$, as predicted. Children performed better on narrated than on

nonnarrated programs. Significant univariate effects of narration occurred for all three subtests, with the strongest effect occurring for auditory comprehension, $F(1,109)=60.54$, $p < .001$, the next strongest for inferential comprehension, $F(1,109)=53.53$, $p < .001$, and the least strong effect for visual comprehension, $F(1,109)=16.54$, $p < .001$. These results support the hypothesis that both visual and inferential comprehension as well as auditory comprehension are enhanced as a function of narration. Again, no interactions of age, sex, and narration were found.

Sex Effects

No main effects of or interactions with sex were found to be significant for auditory attention, visual attention, or total comprehension. The MANOVA did yield a significant effect of sex for the comprehension subtests, Pillais (.07474), $F(3,107)=2.88$, $p < .04$, while no interactions with sex or significant univariate results were found on these measures. Examination of the means in Table 1 shows that females performed slightly better than males on auditory comprehension while males performed slightly better on visual comprehension and inferential comprehension than did females. The strongest, yet nonsignificant effect, occurred for inferential comprehension. These results were not predicted and are of no theoretical importance here. The directions of the subtest score differences were inconsistent and there were no interactions.

Correlations Between Attention and Comprehension

In the correlational analyses reported next, negative correlations between auditory attention and the other measures index a positive relationship because auditory attention is measured by latency, with low values indicating high attention. Zero-order raw and partial correlation coefficients, controlling for age, are presented in Table 2. Wherever the raw correlations drop sharply when age is partialled out, the relationship is merely a function of age differences. In the narrated condition, restore latency as a measure of auditory attention is correlated with all three types of comprehension, but the correlation with comprehension of visual items is due to age. The other three correlations hold up when age is partialled out. In the nonnarrated condition, recall that auditory comprehension scores merely reflect guessing so it is not surprising that no attention measures predict them. Auditory attention still predicts inferential comprehension in the nonnarrated condition, though not as strongly as when narration was present. By contrast, visual attention scores predict all types of comprehension in both conditions (except, of course, nonnarrated auditory items). But in the narrated version, where auditory attention predicted auditory comprehension better than visual comprehension, visual attention better predicts visual than auditory comprehension as hypothesized. Inferential comprehension is correlated with both types of attention, but as expected, the

relation with visual attention is higher than that with auditory attention. Finally, the explanation of the minimal effects of partialling age out of relationships involving visual attention is due to the absence of age differences in visual attention.

The correlation between visual attention and auditory attention was -.15, dropping to -.13 when age was partialled out for the narrated condition. The corresponding figures for the nonnarrated condition were -.07 and -.06. While none of these correlations are significant, the directions and relative magnitude were as expected.

Discussion

In general, the results were as predicted with the exception that auditory attention was no greater in the narrated condition than in the nonnarrated condition. We shall discuss this anomaly last. In general, sex differences were minimal, and as can be seen in Table 1 and Figure 1, they were neither as large, as consistent in direction, nor as often significant as the age and narration effects. In general, the latter favor more attention and better comprehension for older children in any condition and for children of any age in the narrated condition. Interactions are almost nonexistent.

The fact that narration benefited visual and inferential comprehension fully as much as auditory comprehension testifies to the transmodal processing variance contained in both the visual and inferential comprehension measures. In the same way, with age

partialled out, visual attention predicted everything but the guessing of answers to questions about verbal information by children who did not have the narrated version of that story. The evidence suggests, therefore, that visual fixation indexes general central processing level.

Auditory attention, as indexed by our latency to restore method, is more modality-specific than visual attention for acquiring information from a televised presentation. Unlike visual looking, it had a central content monitoring function that enabled it to predict inferential comprehension with age partialled out, even when the program was not narrated.

A source of validation evidence for our restore measure is that, despite auditory attention's essentially zero correlation with visual attention in the nonnarrated condition, auditory attention predicted recall of auditory information, better than visual information, while visual attention predicted the reverse pattern in the narrated condition. Thus restore latency is partially validated as a measure of auditory processing and monitoring of attention-worthy information independent of visual attention.

It remains, however, to explain why auditory attention was not enhanced, as visual attention was, by the presence of narration. One possible explanation is that the auditory degrade technique involved not only the loss of comprehensible auditory information, but an increase in white noise which might have been

aversive, even though there was no volume variation within the degrade. The children may have restored audio clarity within a short time regardless of the condition. Another explanation is that the task might be considered a task of vigilance where the children were constantly monitoring the soundtrack for auditory degrades as well as other information. Therefore, whether or not the condition was narrated, the children restored shortly after initiation of the degrade.

A weak but significant effect is that of auditory attention on inferential comprehension, but not visual comprehension, in the nonnarrated condition. Our interpretation, as suggested above, is that while recall of visually concrete information is a direct function of the amount of visual attention, inferential comprehension is a function of the selectivity of visual attention to central story plot as well. That Selectivity, in turn, is represented by auditory monitoring as well as by visual looking. Visual fixation thus indexes central processing as well as visual attention to the screen. Correspondingly, auditory restore latency indexes level of auditory monitoring to direct visual attention to central content as well as auditory attention to the soundtrack.

In conclusion, the effectiveness of narration as a mediator of children's comprehension of televised information has been supported. While nonsemantic auditory features may direct visual attention, the added auditory attribute of narration contributes

substantially to visual processing of relevant visual information. Also, the auditory restore measure is at least partially validated as a measure of modality-specific auditory attention. It indexes both processing of semantic information when narration is present, and monitoring of content for selective visual attention to central inferential content. Further research is needed to examine by microanalysis the formal features that control auditory restore responses. The presence of speech (in this study, narration) is apparently not one of them. Had the narration been essential to understanding the story, it might have enhanced auditory attention significantly. Recall that the present stories were made originally to be understood without narration. Also needed is a microanalysis of the effects of early versus late restore responses on recall of the content being presented at the moments of auditory degradation.

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Table 1
Cell Means and Marginal Means
for Dependent Measures

(a) Auditory Attention (mean latency to restore)*

Narrated

	Age 5	N	Age 7	N	Total	N
Male	9.42	25	6.58	35	7.76	60
Female	9.95	26	7.20	23	8.66	49
Total	9.69	51	6.83	58	8.17	109

Nonnarrated

	Age 5	N	Age 7	N	Total	N
Male	10.17	24	6.66	35	8.08	59
Female	10.13	26	7.64	23	8.96	49
Total	10.15	50	7.05	58	8.48	108

Combined

	Age 5	N	Age 7	N	Total	N
Male	9.79	24	6.62	35	7.93	59
Female	10.04	26	7.42	23	8.81	49
Total	9.92	50	6.94	58	8.32	108

(b) Visual Attention (mean duration of looking per minute)

Narrated

	Age 5	N	Age 7	N	Total	N
Male	.72	26	.74	35	.73	61
Female	.64	27	.69	23	.66	50
Total	.68	53	.72	58	.69	111

Nonnarrated

	Age 5	N	Age 7	N	Total	N
Male	.61	26	.63	35	.62	61
Female	.49	27	.52	23	.51	50
Total	.55	53	.58	58	.57	111

Table 1 (continued)

Combined

	Age 5	N	Age 7	N	Total	N
Male	.67	26	.68	35	.68	61
Female	.57	27	.61	23	.58	50
Total	.62	53	.64	58	.63	111

(c) Total Comprehension (sum of subtest scores)

Narrated

	Age 5	N	Age 7	N	Total	N
Male	11.74	27	16.91	33	10.33	60
Female	10.82	28	16.19	26	13.41	54
Total	11.27	55	16.60	59	14.03	114

Nonnarrated

	Age 5	N	Age 7	N	Total	N
Male	8.26	27	12.03	33	10.33	60
Female	8.29	28	11.88	25	9.98	53
Total	8.27	55	11.97	58	10.17	113

Combined

	Age 5	N	Age 7	N	Total	N
Male	10.00	27	14.47	33	12.46	60
Female	9.55	28	14.04	25	11.70	53
Total	9.77	55	14.28	58	12.10	113

(d) Auditory Comprehension

Narrated

	Age 5	N	Age 7	N	Total	N
Male	2.56	27	4.24	33	3.48	60
Female	2.64	28	4.23	26	3.41	54
Total	2.60	55	4.24	59	3.45	114

Nonnarrated

	Age 5	N	Age 7	N	Total	N
Male	1.11	27	2.12	33	1.67	60
Female	1.79	28	2.48	25	2.11	53
Total	1.46	55	2.28	58	1.88	113

Table 1 (continued)

Combined

	Age 5	N	Age 7	N	Total	N
Male	1.83	27	3.18	33	2.58	60
Female	2.22	28	3.36	25	2.76	53
Total	2.03	55	3.26	58	2.66	113

(e) Visual Comprehension

Narrated

	Age 5	N	Age 7	N	Total	N
Male	4.41	27	5.76	33	5.15	60
Female	4.04	28	5.92	26	4.94	54
Total	4.22	55	5.83	59	5.05	114

Nonnarrated

	Age 5	N	Age 7	N	Total	N
Male	4.00	27	4.79	33	4.43	60
Female	3.39	28	4.92	25	4.11	53
Total	3.69	55	4.85	58	4.28	113

Combined

	Age 5	N	Age 7	N	Total	N
Male	4.20	27	5.27	33	4.79	60
Female	3.72	28	5.42	25	4.53	53
Total	3.96	55	5.34	58	4.67	113

(f) Inferential Comprehension

Narrated

	Age 5	N	Age 7	N	Total	N
Male	4.78	27	6.91	33	5.96	60
Female	4.14	28	6.04	26	5.06	54
Total	4.46	55	6.53	59	5.53	114

Nonnarrated

	Age 5	N	Age 7	N	Total	N
Male	3.15	27	5.12	33	4.23	60
Female	3.11	28	4.48	25	3.76	53
Total	3.13	55	4.85	58	4.01	113

Table 1 (continued)

	Combined					
	Age 5	N	Age 7	N	Total	N
Male	3.96	27	6.01	33	5.09	60
Female	3.63	28	5.26	25	4.41	53
Total	3.79	55	5.69	58	4.77	113

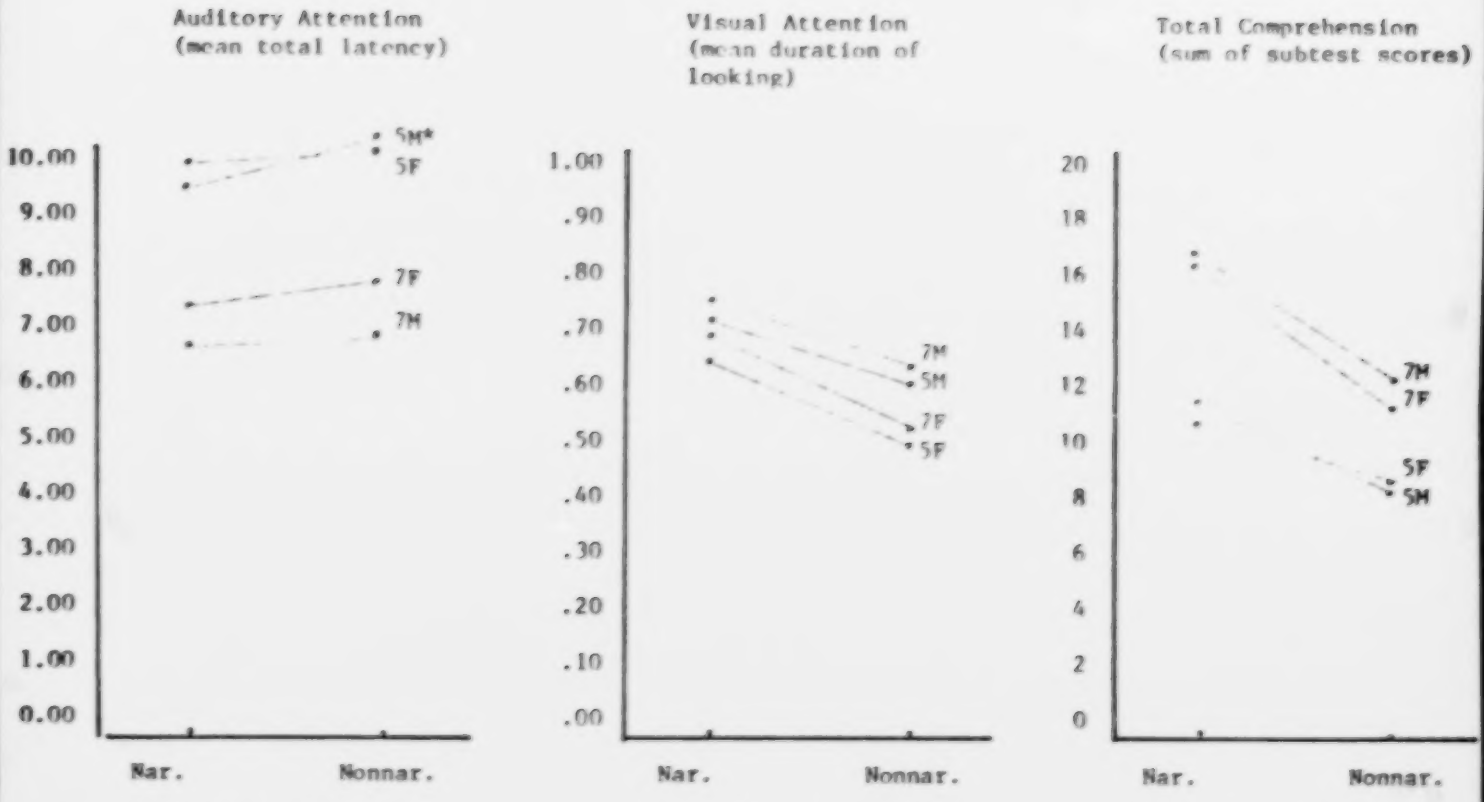
* hundredths of a minute

Table 2
Zero-order Partial Correlation Coefficients, Partialled for Age, Between Comprehension Scores and Auditory and Visual Attention

	Narrated				Nonnarrated			
	Comprehension Scores				Comprehension Scores			
	Auditory	Visual	Inferential	Total	Auditory	Visual	Inferential	Total
Auditory Attn. (mean total latency) d.f.=102	-.53***	-.20*	-.38***	-.46***	-.08	-.21*	-.31***	-.30***
Age Partialled d.f.=101	-.44***	-.05	-.23**	-.33***	-.09	-.09	-.17*	-.12
Visual Attn. (mean duration of looking) d.f.=102	.18*	.46***	.37***	.41***	.02	.56***	.49***	.55***
Age Partialled d.f.=101	.17*	.47***	.39***	.45***	.01	.57***	.51***	.58***

*** p .001
** p .01
* p .05

Figure 1
Pattern of Means for Dependent Variables



Means (nar./nonnar.):

5M: 9.42/10.17
5F: 9.95/10.13
7M: 6.58/ 6.66
7F: 7.20/ 7.64

Means (nar./nonnar.):

5M: .72/.61
5F: .64/.49
7M: .74/.63
7F: .69/.52

Means (nar./nonnar.):

5M: 11.74/8.26
5F: 10.82/8.29
7M: 16.91/12.03
7F: 16.19/11.88

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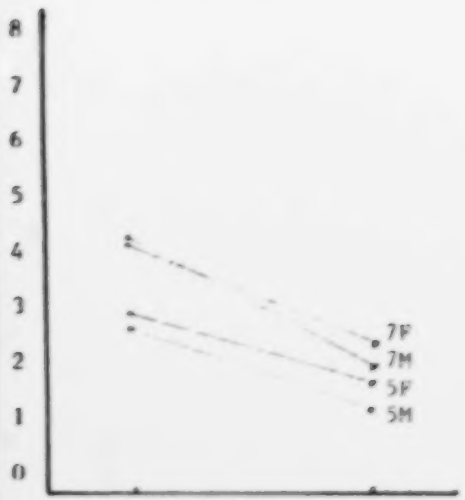
Figure 1 (con't.)

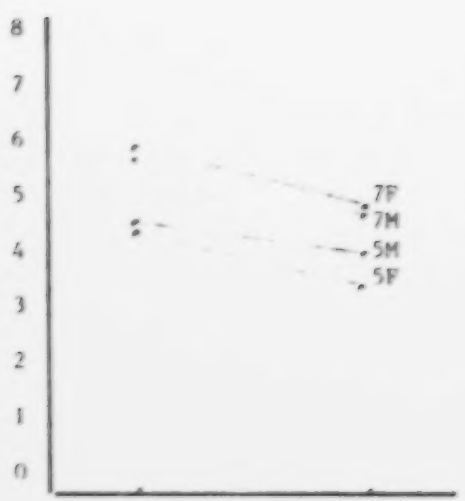
Auditory Comprehension



Means (nar./nonnar.):

5M: 2.56/1.11
5F: 2.64/1.79
7M: 4.24/2.12
7F: 4.23/2.48

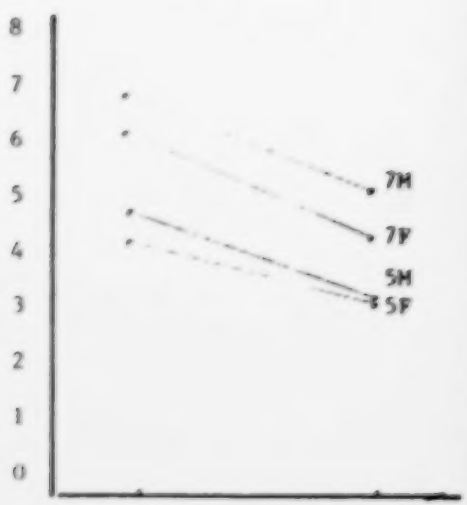
Visual Comprehension



Means (nar./nonnar.):

5M: 4.41/4.00
5F: 4.04/3.39
7M: 5.76/4.79
7F: 5.92/4.92

Inferential Comprehension



Means (nar./nonnar.):

5M: 4.78/3.15
5F: 4.14/3.11
7M: 6.91/5.12
7F: 6.04/4.48

*5M=five-year-old males; 5F=five-year-old females; 7M=seven-year-old males; 7F=seven-year-old females